

SECTION 20 60 13
MOTORS FOR FACILITY SERVICES

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Motor, appurtenances, and accessories

1.02 RELATED SECTIONS

- A. Coordinate with Sections in other Specifications for equipment requiring electrical motors.

1.03 MEASUREMENT AND PAYMENT

- A. General: Motors, as specified herein, will not be measured separately for payment but will be paid for as part of the Contract lump-sum price for the related item of work as indicated in the Bid Schedule of the Bid Form.

1.04 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A582/A582M Specification for Free-Machining Stainless Steel Bars
- B. Institute of Electrical and Electronics Engineers (IEEE):
 - 1. IEEE 85 Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery
- C. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA MG 1 Motors and Generators

1.05 SUBMITTALS

- A. General: Refer to Section 01 33 00, Submittal Procedures, and Section 01 33 23, Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.
- B. Shop Drawings: Submit electrical diagrams of wiring, circuits, switches, and control panels.
- C. Product Data: Submit manufacturer's product data and physical descriptions of electrical motors, including ratings and performance characteristics.
- D. Test Reports: Submit certified test reports of factory tests performed on each motor, in accordance with NEMA MG 1.

- E. Field Test Reports: Submit test results of field performance tests.
- F. Operation and Maintenance Data: Submit O&M data in accordance with Section 01 78 23, Operation and Maintenance Data. Submittal shall include the following information:
 - 1. Description of motor and its components.
 - 2. Manufacturer's operating and maintenance instructions, parts list, illustrations, and diagram for components.
 - 3. Recommended list of spare parts.
 - 4. Wiring diagram.
 - 5. Speed-torque curve.
 - 6. Outline and base dimensions.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Ship motors securely wrapped, crated or packaged, and labeled for safe handling in shipment and to avoid damage.
- B. Store motors in secure and dry storage facility.

PART 2 – PRODUCTS

2.01 MOTOR, APPURTENANCES, AND ACCESSORIES

- A. Manufacturing Standards: NEMA MG 1, squirrel cage induction type, unless otherwise indicated. Provide nameplate on each motor in accordance with NEMA MG 1, Section 10.37.
- B. Ratings:
 - 1. Horsepower (hp): as indicated.
 - 2. Voltage and Frequency:
 - a. 1/2 hp and less: 115 V, single phase, 60 Hz supply.
 - b. 3/4 hp up to and including 100 hp: 460 V, three-phase, 60 Hz supply, unless otherwise indicated.
 - c. Above 100 hp: 4160 V, three-phase, 60 Hz supply, unless otherwise indicated.
 - 3. Speed and Number of Poles: As indicated.
 - 4. Time Rating: Continuous, unless otherwise indicated.

5. Operation: Suitable for operation at variation of frequency and voltage of plus or minus ten percent of rating without damage.
- C. Design Letters:
1. Single Phase Motors: Design N, suitable for full voltage across-the-line starting.
 2. Three Phase Motors: Design B, unless otherwise indicated, and suitable for full voltage across-the-line starting.
- D. Service Factor:
1. Up to and including one hp motor: NEMA MG 1, Section 12.47.
 2. Above one hp and up to and including 200 hp motors: 1.15.
 3. Above 200 hp motors: 1.15.
- E. Insulation: Class B for operation in an ambient temperature of 40 degrees Celsius. Provide epoxy encapsulated except for fractional horsepower motors, hermetically sealed and semi-hermetically sealed compressor motors.
- F. Noise Level: NEMA MG 1, Section 12.49, but not to exceed CAL/OSHA requirements when measured in accordance with IEEE 85.
- G. Energy Efficiency: Motor shall be copper-wound premium efficiency type, with efficiency of 95 percent or higher.
- H. Enclosure: Drip-proof fully-guarded or totally-enclosed fan-cooled-guarded as indicated, with the following additional requirements:
1. Heavy-duty steel or cast iron frame with cast iron end brackets.
 2. Foot-mounted on pad or adjustable pad as required or otherwise indicated.
 3. Provision for grounding.
 4. Red oxide zinc chromate primer with finish coat of heavy-duty industrial polyurethane enamel in gray color as selected by the District Representative.
 5. Provide drain plug for condensate drainage.
 6. Enclosures for motors installed in hazardous areas shall be of group and class approved for the type of hazard in which they are located.
- I. Conduit Box: Cast iron diagonally split type, suitably gasketed, with the following additional requirements:
1. Size suitable to accommodate the motor leads, line leads and connections to heaters, including taping, but not less than required by NEMA MG 1.
 2. Rotatable in any of the four 90 degree positions.

3. Threaded conduit holes.
- J. Bearings: 15 years' average life, but not less than three years at continuous operation, with double shields and the following additional requirements:
 1. Up to and including five hp Motors: Sealed ball or roller bearings, unless otherwise indicated.
 2. Above five hp and up to 200 hp Motors: Ball or roller bearings with grease fittings and minimum pressure-relief fittings for in-service lubrication.
 3. Compressor and Vertical Pump Motors: As indicated.
- K. Motors for Hermetically Sealed and Semi-hermetically Sealed Compressors: NEMA MG 1, Sections 18.076 through 18.093.
- L. Motors for Close-Coupled Pumps: Stainless steel shaft in accordance with ASTM A582/A582M, Type 303.
- M. Heaters: Provide as indicated and wired to the conduit box.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Wire and connect motors in accordance with the manufacturer's instructions and recommendations and as indicated.
- B. Install conduit in accordance with Section 20 50 13, Raceways for Facility Services.
- C. Connect power cable as indicated and in accordance with Section 26 05 24, Low Voltage Wires and Cables.
- D. Ground motor enclosure in accordance with Section 26 05 26, Grounding and Bonding for Electrical Systems.
- E. Provide liquid tight flexible metal conduit connection at motor.

3.02 FIELD QUALITY CONTROL

- A. Conform to applicable requirements of Section 01 45 24, Testing Program Requirements.
- B. Perform the following tests under the observation of the Engineer. Furnish equipment, instruments, and measuring devices as required to perform the tests. Tests shall be performed with motor connected to its permanent source of power.
 1. Test circuits for connections in accordance with the wiring diagram. Test motors for correct rotation. Disconnect motor shaft from driven machine if damage may be caused by incorrect rotation.

2. Test that insulation resistance to ground of non-grounded conductor is a minimum of 10 MΩ.
3. Test motor enclosure for continuity to the grounding system.
4. Test operation of circuits and controls for motors. When testing, operate each control a minimum of ten times and each circuit continuously for a minimum of 1/2 hour.

END OF SECTION 20 60 13